

WHAT IS CLAIMED IS:

1. An antimicrobial wound covering article, wherein at least a part of the article comprises a polyurethane resin which is associated with a particulate, silver containing glass, said glass being capable of releasing silver ions when coming into contact with a wound exudate.
2. The article of claim 1, wherein at least a part of the polyurethane resin forms a matrix which comprises at least a part of the particulate glass.
3. The article of claim 1, wherein at least a part of the particulate glass is present on a surface of a structure which comprises the polyurethane resin.
4. The article of claim 1, wherein at least a part of the polyurethane resin forms a sheet-like structure.
5. The article of claim 1, wherein at least a part of the polyurethane resin comprises a polyurethane foam.
6. The article of claim 4, wherein at least a part of the polyurethane resin is not foamed.
7. The article of claim 1, wherein the polyurethane resin forms a gel-like material.
8. The article of claim 7, wherein at least a part of an external surface of the article comprises the polyurethane resin.
9. The article of claim 4, wherein at least a part of the polyurethane resin and at least a part of the particulate glass form a layer which has an area weight of from about 400 g/m<sup>2</sup> to about 1200 g/m<sup>2</sup>.

10. The article of claim 2, wherein at least a part of the polyurethane resin and at least a part of the particulate glass form a sheet-like layer having a thickness of from about 0.1 mm to about 2 mm.
11. The article of claim 6, wherein at least a part of the polyurethane resin and at least a part of the particulate glass form a layer having a thickness of from about 0.4 mm to about 1.5 mm.
12. The article of claim 1, wherein at least a part of the polyurethane resin and at least a part of the particulate glass form a sheet-like layer having a thickness of from about 0.6 mm to about 1.2 mm.
13. The article of claim 9, wherein the polyurethane resin has a liquid absorption capacity of from about 0.5 g/g to about 10 g/g.
14. The article of claim 8, wherein the polyurethane resin has a liquid absorption capacity of from about 1 g/g to about 6 g/g.
15. The article of claim 11, wherein the polyurethane resin has a liquid absorption capacity of from about 1.5 g/g to about 3.5 g/g.
16. The article of claim 9, wherein the layer has a water vapor permeability of from about 100 g/(m<sup>2</sup>\*24h) to about 5,000 g/(m<sup>2</sup>\*24h).
17. The article of claim 10, wherein the layer has a water vapor permeability of from about 250 g/(m<sup>2</sup>\*24h) to about 2,500 g/(m<sup>2</sup>\*24h).
18. The article of claim 11, wherein the layer has a water vapor permeability of from about 300 g/(m<sup>2</sup>\*24h) to about 1,500 g/(m<sup>2</sup>\*24h).
19. The article of claim 8, wherein the polyurethane resin is self-adhesive.

20. The article of claim 1, wherein the polyurethane resin comprises a pigment.
21. The article of claim 20, wherein the pigment comprises  $\text{TiO}_2$ .
22. The article of claim 21, wherein the  $\text{TiO}_2$  is present in an amount of from about 0.01 % by weight to about 2 % by weight, based on the weight of the polyurethane resin.
23. The article of claim 1, wherein the article further comprises a superabsorber.
24. The article of claim 23, wherein the superabsorber is present in an amount of from about 0.5 % by weight to about 30 % by weight, based on the weight of the polyurethane resin.
25. The article of claim 1, wherein the polyurethane comprises units which are derived from a polyol component which comprises at least one polyether polyol.
26. The article of claim 25, wherein the at least one polyether polyol comprises from about 2 to about 6 hydroxy groups.
27. The article of claim 26, wherein the at least one polyether polyol has a hydroxy number of from about 20 to about 120.
28. The article of claim 27, wherein the at least one polyether polyol comprises at least about 10 % by weight of units which are derived from ethylene oxide.
29. The article of claim 26, wherein the at least one polyether polyol comprises units which are derived from ethylene oxide, propylene oxide and at least one compound having more than two hydroxy groups.
30. The article of claim 29, wherein the at least one compound comprises pentaerythritol.

31. The article of claim 25, wherein the at least one polyether polyol has a weight average molecular weight of from about 2,000 to about 8,000.
32. The article of claim 1, wherein the polyurethane comprises units which are derived from a polyisocyanate component which comprises at least one aliphatic polyisocyanate.
33. The article of claim 32, wherein the aliphatic polyisocyanate comprises at least one polymethylene diisocyanate which has from about 2 to about 8 methylene groups.
34. The article of claim 33, wherein the aliphatic diisocyanate comprises hexamethylene diisocyanate.
35. The article of claim 2, wherein the polyurethane comprises units which are derived from at least one polyether polyol and at least one aliphatic diisocyanate.
36. The article of claim 35, wherein the at least one polyether polyol comprises from about 2 to about 6 hydroxy groups, has a hydroxy number of from about 20 to about 120 and comprises at least about 10 % by weight of units which are derived from ethylene oxide.
37. The article of claim 36, wherein the at least one aliphatic diisocyanate comprises hexamethylene diisocyanate.
38. The article of claim 1, wherein a ratio of a number of free isocyanate groups in a polyisocyanate starting material to a number of free hydroxy groups in a polyol starting material for producing the polyurethane is in the range of from about 0.3 to about 0.7.
39. The article of claim 1, wherein a product of a functionality of a polyisocyanate starting material and a functionality of a polyol starting material for producing the polyurethane is at least about 5.2.

40. The article of claim 1, wherein the glass comprises particles having a volume-related particle size of from about 0.1  $\mu\text{m}$  to about 10  $\mu\text{m}$ .
41. The article of claim 1, wherein the glass comprises glass fibers.
42. The article of claim 40, wherein the glass comprises not more than about 5 % by weight of residual water.
43. The article of claim 40, wherein the glass comprises about 40-60 mole-% of  $\text{P}_2\text{O}_5$ , about 35-55 mole-% of at least one of  $\text{CaO}$ ,  $\text{MgO}$ ,  $\text{ZnO}$  and  $\text{CuO}$ , up to about 5 mole-% of at least one of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$  and  $\text{Li}_2\text{O}$ , and about 5-20 mole-% of at least one of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$  and  $\text{B}_2\text{O}_3$ , and contains from about 0.1 % by weight to about 8 % by weight of  $\text{Ag}_2\text{O}$ .
44. The article of claim 42, wherein the glass comprises about 45-55 mole-% of  $\text{P}_2\text{O}_5$ , about 40-50 mole-% of at least one of  $\text{CaO}$  and  $\text{MgO}$ , up to about 5 mole-% of at least one of  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$ , and about 5-10 mole-% of at least one of  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ , and contains from about 0.5 % by weight to about 5 % by weight of  $\text{Ag}_2\text{O}$ .
45. The article of claim 2, wherein the glass comprises about 45-55 mole-% of  $\text{P}_2\text{O}_5$ , about 40-50 mole-% of  $\text{MgO}$ , and about 5-10 mole-% of at least one of  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ , and contains from about 1% by weight to about 3 % by weight of  $\text{Ag}_2\text{O}$ .
46. The article of claim 1, wherein the glass comprises about 49-51 mole-% of  $\text{P}_2\text{O}_5$ , about 43-45 mole-% of  $\text{MgO}$ , and about 5-7 mole-% of  $\text{Al}_2\text{O}_3$ , and contains from about 1.5 % by weight to about 2.5 % by weight of  $\text{Ag}_2\text{O}$ .
47. The article of claim 9, wherein the glass is present in an amount of from about 0.01 % by weight to about 40 % by weight, based on the combined weight of the glass and the polyurethane resin.

48. The article of claim 43, wherein the glass is present in an amount of from about 0.05 % by weight to about 10 % by weight, based on the combined weight of the glass and the polyurethane resin.

49. The article of claim 1, wherein the glass is present in an amount of from about 0.1 % by weight to about 5 % by weight, based on the combined weight of the glass and the polyurethane resin.

50. The article of claim 1, wherein the article is capable of releasing silver ions for at least about 10 hours when in contact with a wound exudate.

51. The article of claim 48, wherein the article is capable of releasing silver ions for at least about 24 hours when in contact with a wound exudate.

52. The article of claim 49, wherein the polyurethane resin comprises at least one of elemental Al, Zn, Mg and basic compounds thereof.

53. The article of claim 52, wherein said at least one of elemental Al, Zn, Mg and basic compounds thereof is present in an amount of from about 0.01 % by weight to about 5 % by weight, based on the weight of the polyurethane resin.

54. The article of claim 49, wherein the glass contains from about 0.5 to about 2.5 % by weight of  $\text{Ag}_2\text{O}$ .

55. The article of claim 1, wherein the polyurethane comprises units which are derived from at least one polyether polyol and at least one aliphatic diisocyanate, and wherein the glass comprises about 45-55 mole-% of  $\text{P}_2\text{O}_5$ , about 40-50 mole-% of  $\text{MgO}$ , and about 5-10 mole-% of at least one of  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ , and contains from about 1 % by weight to about 3 % by weight of  $\text{Ag}_2\text{O}$ .

56. The article of claim 1, wherein the article further comprises a backing material.

57. The article of claim 56, wherein the backing material comprises a polyurethane.
58. The article of claim 57, wherein the backing material comprises a polyurethane sheet having a pressure sensitive adhesive on a side thereof which faces the polyurethane resin which is associated with the glass.
59. The article of claim 58, wherein the polyurethane sheet is substantially transparent.
60. The article of claim 56, wherein the article is a bandage.
61. The article of claim 59, wherein the article is a bandage.
62. The article of claim 1, wherein the article is one of a wound dressing, a wound pad and a compress.
63. The article of claim 43, wherein the article releases silver at a rate of from about 5 mg/(m<sup>2</sup>\*24h) to about 50 mg/(m<sup>2</sup>\*24h).
64. The article of claim 1, wherein the article releases silver at a rate of from about 10 mg/(m<sup>2</sup>\*24h) to about 40 mg/(m<sup>2</sup>\*24h).
65. The article of claim 1, wherein the polyurethane resin comprises the residue of a Bi containing catalyst.
66. The article of claim 2 wherein the polyurethane resin has been formed by reacting at least one polyol and at least one polyisocyanate in the presence of the particulate glass.
67. The article of claim 1, wherein the polyurethane comprises units which are derived from hexamethylene diisocyanate and units which are derived from at least one polyether polyol having a hydroxy number of from about 20 to about 120 and comprising

at least about 10 % by weight of ethylene oxide units, wherein the particulate glass has a volume-related particle size of from about 0.1  $\mu\text{m}$  to about 10  $\mu\text{m}$ , comprises about 45-55 mole-% of  $\text{P}_2\text{O}_5$ , about 40-50 mole-% of  $\text{MgO}$ , and about 5-10 mole-% of  $\text{Al}_2\text{O}_3$ , and contains from about 1 % by weight to about 3 % by weight of  $\text{Ag}_2\text{O}$ , and wherein the polyurethane resin forms a matrix which contains about 0.1 % by weight to about 5 % by weight of the glass, based on the combined weight of the glass and the polyurethane.

68. A method of covering a wound, wherein the method comprises placing on the wound at least a portion of a wound covering article which comprises a polyurethane resin which is associated with a particulate, silver containing glass.

69. The method of claim 68, wherein the polyurethane resin is brought into direct contact with the wound.

70. The method of claim 69, wherein the polyurethane resin has a liquid absorption capacity of from about 1 g/g to about 6 g/g.

71. The method of claim 69, wherein the polyurethane resin has a water vapor permeability of from about 250  $\text{g}/(\text{m}^2 \cdot 24\text{h})$  to about 2,500  $\text{g}/(\text{m}^2 \cdot 24\text{h})$ .

72. The method of claim 68, wherein the polyurethane resin comprises units derived from at least one polyetherpolyol and at least one aliphatic diisocyanate.

73. The method of claim 72, wherein the glass comprises particles having a volume-related particle size in a range of from about 0.1  $\mu\text{m}$  to about 10  $\mu\text{m}$ .

74. The method of claim 72, wherein the glass comprises about 45-55 mole-% of  $\text{P}_2\text{O}_5$ , about 40-50 mole-% of at least one of  $\text{CaO}$  and  $\text{MgO}$ , up to about 5 mole-% of at least one of  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$ , and about 5-10 mole-% of at least one of  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$ , and contains from about 0.5 % by weight to about 3 % by weight of  $\text{Ag}_2\text{O}$ .



75. The method of claim 68, wherein the article further comprises a backing material.
76. The method of claim 75, wherein the backing material comprises a polyurethane.
77. The method of claim 68, wherein the article is a bandage.
78. The method of claim 77, wherein the article releases silver at a rate of from about 10 mg/(m<sup>2</sup>\*24h) to about 40 mg/(m<sup>2</sup>\*24h).
79. A process for making an antimicrobial wound covering article, wherein the process comprises combining a silver containing, particulate glass and a polyurethane resin so that a mixture wherein the polyurethane resin is in direct contact with the particulate glass is formed.
80. The process of claim 79, wherein the combining of the polyurethane and the glass comprises conducting, in the presence of the glass, a reaction between a polyol component and a polyisocyanate component to form the polyurethane resin.
81. The process of claim 80, further comprising shaping the mixture and affixing the shaped mixture to a backing layer.
82. The process of claim 79, wherein at least a part of the polyurethane resin and at least a part of the particulate glass are made into a sheet-like layer having a thickness of from about 0.1 mm to about 2 mm.
83. The process of claim 79, wherein the polyurethane comprises units which are derived from at least one polyether polyol.
84. The process of claim 83, wherein the at least one polyether polyol comprises from about 2 to about 6 hydroxy groups, has a hydroxy number of from about 20 to about 120 and comprises at least about 10 % by weight of units derived from ethylene oxide.

85. The process of claim 83, wherein the polyurethane comprises units which are derived from at least one aliphatic polyisocyanate.

86. The process of claim 85, wherein the aliphatic polyisocyanate comprises hexamethylene diisocyanate.

87. The process of claim 82, wherein the glass comprises particles having a volume-related particle size in a range of from about 0.1  $\mu\text{m}$  to about 10  $\mu\text{m}$ .

88. The process of claim 80, wherein the glass comprises about 40-60 mole-% of  $\text{P}_2\text{O}_5$ , about 35-55 mole-% of at least one of  $\text{CaO}$ ,  $\text{MgO}$ ,  $\text{ZnO}$  and  $\text{CuO}$ , up to about 5 mole-% of at least one of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$  and  $\text{Li}_2\text{O}$ , and about 5-20 mole-% of at least one of  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$  and  $\text{B}_2\text{O}_3$ , and contains from about 0.1 % by weight to about 5 % by weight of  $\text{Ag}_2\text{O}$ .

89. The process of claim 88, wherein the glass is used in an amount of from about 0.01 % by weight to about 40 % by weight, based on the combined weight of the glass and the polyurethane resin.

90. The process of claim 80, wherein the reaction is catalyzed by a Bi compound.

91. The process of claim 90, wherein the Bi compound comprises a Bi carboxylate.

92. The process of claim 79, wherein the process further comprises combining the mixture with a backing material.

93. The process of claim 92, wherein the mixture is bonded to the backing material through an adhesive.

94. The process of claim 92, wherein the backing material comprises a polyurethane sheet.

95. The process of claim 79, which further comprises a sterilization of the article.
96. The process of claim 95, wherein the sterilization comprises irradiating the article with  $\gamma$ -rays.
97. The process of claim 95, wherein the sterilization does not result in a noticeable discoloration of the article.
98. The article of claim 1, wherein the article does not show a noticeable discoloration after having been kept at 50 °C for 6 months.
99. The article of claim 67, wherein the article does not show a noticeable discoloration after having been kept at 50 °C for 6 months.
100. The article of claim 1, wherein the article does not show a noticeable discoloration after having been sterilized with 26 kGy of  $\gamma$ -rays .
101. The article of claim 1, wherein the article shows an antimicrobial activity against *Escherichia coli* IFO 3972 of at least about 3.6, when tested according to JIS 2801:2000.
102. The article of claim 1, wherein the article shows an antimicrobial activity against *Staphylococcus aureus* of at least about 3.3, when tested according to JIS 2801:2000.